

**TRANSPORTATION SCIENCES
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**GENERAL DYNAMICS ON-SITE CHILD SAFETY SEAT INVESTIGATION
SCI TECHNICAL SUMMARY REPORT**

CASE NO. CA03-037

VEHICLE – 1992 FORD TEMPO

LOCATION - STATE OF NEW YORK

CRASH DATE – JUNE 2003

Contract No. DTNH22-01-C-17002

Prepared for:

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

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<i>16. Abstract</i> This on-site investigation focused on the performance of a forward-facing child safety seat (CSS) that was installed in a 1992 Ford Tempo. The Tempo was occupied by a 20-year-old female driver and a 10-month-old female child passenger who was restrained in a forward-facing convertible CSS. The Tempo was stopped in the eastbound travel lane of a two-lane roadway waiting to initiate a left turn onto a local roadway. The stationary Tempo was struck in the rear by a 1999 Ford F-350 Super-Duty utility/flat-bed truck that was traveling in the same lane and did not detect the vehicle stopped in the roadway. The severe impact accelerated the Tempo across the intersection in a counterclockwise (CCW) rotation into the opposing travel lane. A 1996 Ford Thunderbird was traveling in the opposite direction and struck the rear of the Tempo with the front right corner. The occupants of the Tempo initiated rearward trajectories in response to the initial impact. They were displaced slightly during the post-impact travel and were redirected rearward in response to the secondary impact with the Thunderbird. The female driver sustained a complaint of back pain. The 10-month-old child sustained a left forehead contusion as a result of a plastic baby toy or bottle that the child was holding at the time of the crash. Both occupants of the Tempo were transported by ambulance to a local hospital for treatment and released.			
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**GENERAL DYNAMICS ON-SITE CHILD SAFETY SEAT CRASH INVESTIGATION
SCI TECHNICAL SUMMARY REPORT
CASE NO. – CA03-037
SUBJECT VEHICLE – 1992 FORD TEMPO
LOCATION - STATE OF NEW YORK
CRASH DATE – JUNE 2003**

BACKGROUND

This on-site investigation focused on the performance of a forward-facing child safety seat (CSS) that was installed in a 1992 Ford Tempo (**Figure 1**). The Tempo was occupied by a 20-year-old female driver and a 10-month-old female child passenger who was restrained in a forward-facing convertible CSS. The Tempo was stopped in the eastbound travel lane of a two-lane roadway waiting to initiate a left turn onto a local roadway. The stationary Tempo was struck in the rear by a 1999 Ford F-350 Super-Duty utility/flat-bed truck that was traveling in the same lane and did not detect the vehicle stopped in the roadway. The severe impact accelerated the Tempo across the intersection in a



Figure 1. Damaged 1992 Ford Tempo

counterclockwise (CCW) rotation into the opposing travel lane. A 1996 Ford Thunderbird was traveling in the opposite direction and struck the rear of the Tempo with the front right corner. The occupants of the Tempo initiated rearward trajectories in response to the initial impact. They were displaced slightly during the post-impact travel and were redirected rearward in response to the secondary impact with the Thunderbird. The female driver sustained a complaint of back pain. The 10-month-old child sustained a left forehead contusion as a result of a plastic baby toy or bottle that the child was holding at the time of the crash. Both occupants of the Tempo were transported by ambulance to a local hospital for treatment and released.

This crash was identified by the General Dynamics SCI team through a local news agency. The crash information was forwarded from the General Dynamics SCI team to the Crash Investigation Division of the National Highway Traffic Safety Administration (NHTSA) due to the presence of the CSS. An on-site investigation was initiated on June 2, 2003.

VEHICLE DATA – 1992 Ford Tempo

The 1992 Ford Tempo was identified by the Vehicle Identification Number (VIN): 2FAPP36X2NB (production sequence omitted). At the time of the vehicle inspection, the Tempo's odometer read 104,315 km (64,820 miles). The vehicle was a four-door sedan that was equipped with a 2.3 liter, 4-cylinder engine, front-wheel-drive, an automatic transmission, power brakes, power steering, and a tilt steering wheel. The Tempo was equipped with P185/70R14 tires. The manufacturer's label was not accessible, as the left front door was jammed shut. The recommended tire pressure was unknown. The specific tire data was as follows:

Position	Tire	Measured Pressure	Tread Depth	Restricted	Damage
LF	Starfire Flite-Line IV	258.6 kpa (37.5 psi)	7 mm (9/32")	No	None
LR	Cooper Sport Master GLT	213.7 kpa (31.0 psi)	6 mm (8/32")	Yes	None
RF	Starfire Flite-Line IV	165.5 kpa (24.0 psi)	6 mm (8/32")	No	None
RR	Cooper Sport Master GLT	255.1 kpa (37.0 psi)	6 mm (8/32")	Restricted	None

The 1992 Ford Tempo was configured with bucket seats for the front seating positions with adjustable head restraints and a bench seat with a fixed seat back for the three rear seating positions. The driver's seat track was jammed and positioned in a mid-track position at the time of the inspection. At the time of the vehicle inspection, the driver's head restraint was positioned 3.8 cm (1.5") above the seat back and the front right head restraint was in the full-down position.

VEHICLE DATA – 1999 FORD F-350 MEDIUM TRUCK

The 1999 Ford F-350 Super-Duty utility/flat-bed truck was identified by the VIN: 1FDWF36L9XE (production sequence omitted). At the time of the vehicle inspection, the odometer read 46,945 km (29,171 miles). The truck was configured with a Ford F-350 super-duty incomplete chassis that was equipped with a flat steel deck that measured 365.8 cm (144.0") in length and 243.8 cm (96.0") in width. A raised steel ladder rack was present on the left side aspect of steel deck. The truck was configured with a 5.4 liter, V-8 engine, automatic transmission, power steering, and a tilt steering wheel. The F-350 was also equipped with redesigned frontal air bags for the driver and front right seat positions.

VEHICLE DATA – 1996 FORD THUNDERBIRD

The 1996 Ford Thunderbird was identified by the VIN: 1FALP6248TH (production sequence omitted). The vehicle was a two-door coupe that was equipped with a 3.8 liter, V-6 engine, automatic four-speed transmission, power brakes, power steering, and a tilt steering wheel.

CRASH SITE

This three-vehicle crash occurred during the daylight hours of June 2003 in the state of New York. The crash occurred at the T-intersection of a two-lane, east/west arterial roadway and a north/south local roadway (**Figure 2**). At the time of the crash, the weather was clear and the asphalt roadway surface was dry. The east/west roadway was configured with one travel lane in each direction that were separated by a broken yellow centerline and bordered by asphalt shoulders. The undivided north/south roadway was configured with one travel lane in each direction and bordered by asphalt shoulders and asphalt driveways. The roadside environment consisted of wooded areas on the south roadside and commercial properties on the north roadside. The posted speed limit for the



Figure 2. Overall view of scene looking east

east/west roadway was 64 km/h (40 mph). The scene schematic is included as **Figure 18** of this report.

CRASH SEQUENCE

Pre-Crash

The 20-year-old female driver of the 1992 Ford Tempo brought the vehicle to a controlled stop on the eastbound lane of the west leg of the T-intersection (**Figure 3**). She was planning to initiate a left turn onto the north/south roadway and was waiting for westbound traffic to clear the intersection. It was not known if she had activated the left turn signal. The 19-year-old male driver of the Ford F-350 truck was operating the vehicle in an eastbound direction on the arterial roadway. He did not detect the Ford Tempo that was stopped in the lane ahead of his vehicle. As the Ford F-350 approached the intersection, the driver observed the stopped Tempo in the lane and attempted to steer to the right immediately prior to the collision. There were no pre-crash tire marks from the F-350. A 1996 Ford Thunderbird was traveling in the eastbound lane on approach to the T-intersection at the time of the crash, but was not involved in the initial collision (**Figure 4**).

Crash

The front aspect of the Ford F-350 struck the rear aspect of the Ford Tempo. The impact resulted in severe damage to the Tempo and minor damage to the F-350. The directions of force for the Tempo and F-350 were in the 6 and 12 o'clock sectors, respectively. The damage algorithm of the WinSMASH program computed a total delta-V of 56.0 km/h (34.8 mph) for the Tempo and 18.0 km/h (11.2 mph) for the Ford F-350. The impact was not sufficient to deploy the frontal air bag system in the F-350. The impact accelerated the Tempo forward in a CCW yaw into the opposite lane as it traversed the intersection. The Tempo rotated approximately 140 degrees across the intersection, into the path of the 1996 Thunderbird, which was traveling in the westbound lane. A curved tire scuff from the right rear tire was present in the intersection that began at the point of impact and continued to the point of the secondary impact (**Figure 5**). The front right corner of the Thunderbird struck the rear left corner of the Tempo. The directions of force were in the 12 and 6 o'clock sectors, for the Thunderbird and the Tempo, respectively. The missing vehicle algorithm of the WinSMASH program computed a total delta-V of 12.0 km/h (7.5 mph) based



Figure 3. Eastbound approach for the Tempo and the Ford F-350 truck



Figure 4. Westbound approach for the Ford Thunderbird



Figure 5. Close-up of point of impact and right rear tire mark

on the crush profile of the Thunderbird. The Missing Vehicle routine of the WinSMASH program computed a total delta-V of 17.0 km/h (10.5 mph) for the secondary impact for the Tempo due to the masking damage. The Tempo was deflected onto the asphalt shoulder to final rest. The final rest positions of the Ford F-350 and Ford Thunderbird were not known.

Post-Crash

The driver of the Tempo exited the vehicle under her own power and removed the child from the CSS. The female driver was transported by ambulance to a local hospital. The child passenger was restrained in an inflatable CSS by EMS personnel and transported by ambulance to a local hospital with a forehead contusion. Both were treated and released.

VEHICLE DAMAGE

Exterior Damage – 1992 Ford Tempo

The 1992 Ford Tempo sustained severe damage as a result of the rear impact with the Ford F-350. The direct damage began 91.4 cm (36.0”) right of the centerline and extended 185.4 cm (73.0”) to the right across the back plane. It should be noted that this measurement was documented along the damage profile. The maximum crush was located at the rear right corner and measured 85.7 cm (33.8”). The rear bumper fascia was abraded, fractured, and completely separated as a result of direct contact. The entire width of the bumper and trunk rear trunk wall were crushed forward from the impact (**Figure 6**). The left rear Energy Absorption Device (EAD) stroke measured 6.4 cm (2.5”) and the right rear EAD stroke measured 5.1 cm (2.0”). The bumper was completely separated from the mounting brackets of both EAD’s. The sheet metal on the forward aspect the left EAD was completely torn in a vertical fashion and the left EAD face was rotated outward to the left. The entire right EAD was rotated upward and inward and separated completely from the vehicle’s structure (**Figure 7**).

The rear face of the right EAD was facing upward. The trunk lid was crushed rearward, buckled upward, and disengaged from the latch. The forward displacement of the trunk lid allowed the forward edge of the trunk lid to contact the backlight header (**Figure 8**). The abrasion from the trunk lid contact began 16.5 cm (6.5”) right of the centerline, extended 29.2 cm (11.5”)



Figure 6. View of the rear damage to the Tempo



Figure 7. Close up of the right side EAD



Figure 8. Lateral view showing the severe crush and trunk lid contact with the backlight header

to the right, and continued onto the roof. Matching abrasions were present on the right interior aspect of the trunk lid. The backlight header was crushed forward 24.3 cm (9.5") at the right aspect. The combined direct and induced damage measured 116.8 cm (46.0") across the back plane. Both quarter panels were crushed forward and buckled outward. The severe rear crush resulted in the reduction of the left wheelbase by 14.0 cm (5.5") and the reduction of the right wheelbase by 6.0 cm (2.4"). Both rear wheels were restricted due to the forward displacement. The fuel filler neck was crushed and abraded from engagement between the right rear quarter panel and the vehicle frame. The exhaust pipe was crushed and buckled, and was protruding outboard of the left rear sill. Both rear doors were displaced forward and were jammed shut.

The roof was buckled forward of the C-pillars. Six crush measurements were documented along the rear trunk lip and were as follows: C1 = 65.4 cm (25.8"), C2 = 74.9 cm (29.5"), C3 = 75.6 cm (29.8"), C4 = 74.3 cm (29.3"), C5 = 78.1 cm (30.8"), C6 = 85.7 cm (33.8"). The Collision Deformation Classification for the rear impact with the Ford F-350 was 06-BDEW-6.

The Tempo sustained minor rear left corner damage as a result of the secondary impact with the Ford Thunderbird. The direct damage began 35.6 cm (14.0") left of the centerline and extended 40.6 cm (16.0") to the left corner. Green paint transfers were present on the left corner of the rear wall of the trunk from direct contact with the Thunderbird. Due to the masking damage from the initial impact, a crush profile for the secondary impact could not be documented. The partial CDC for the secondary impact was 05-B9E9-9. The extent zone could not be determined due to the masking damage from the initial impact.

Interior Damage -1992 Ford Tempo

The Tempo sustained moderate interior damage as a result of passenger compartment intrusion. Both rear door windows and the backlight disintegrated as a result of the initial impact. The driver's seat was deflected rearward as a result of occupant loading (**Figure 9**). At the time of the inspection, the seat back was reclined 60 degrees from vertical and the recline adjustment mechanism was jammed. The driver's seat cushion was displaced upward, and the outboard side measured 7.0 cm (2.8") above the inboard aspect of the cushion. The center armrest was displaced 1.9 cm (0.8") to the right. The right sun visor was displaced rearward, disengaged from the bracket.

Vertical linear scuffs were present 3.8 cm (1.5") below the top of the rear seat back on the forward aspect from engagement with the plastic shell of the CSS (**Figure 10**). The left scuff was located 14.0 cm (5.5") right of the centerline and measured 17.8 cm (7.0") in length. The right scuff was located 11.4 cm (4.5") right of the centerline and measured 12.7 cm (5.0") in length. Two



Figure 9. View of driver's seat and displaced arm rest



Figure 10. View of scuffs on rear seat back

smaller linear scuffs that measured 3.2 cm (1.3”) were located 7.6 cm (3.0”) below the top aspect of the seat back and 0.6 cm (0.3”) and 1.9 cm (0.8”) left and right of the centerline, respectfully. There was no contact evidence on the rear aspects of the front seat backs.

A scuff on the headliner was located 25.4 cm (10.0”) aft of the windshield header and 11.4 cm (4.5”) left of the centerline from probable contact with a loose baby toy in the vehicle. The scuff measured 55.2 cm (21.8”) in length and extended diagonally to the left and to the rear on the headliner.

Multiple intrusions were documented as follows:

Position	Component	Magnitude of Intrusion	Direction
Rear left	Rear left seat back	19.7 cm (7.8”)	Longitudinal
Rear left	Backlight header	17.8 cm (7.0”)	Longitudinal
Rear left	Left C-pillar	7.6 cm (3.0”)	Longitudinal
Rear left	Rear left seat cushion	6.4 cm (2.5”)	Longitudinal
Rear left	Backlight header	1.9 cm (0.8”)	Vertical
Rear center	Rear center seat back	27.9 cm (11.0”)	Longitudinal
Rear center	Backlight header	19.1 cm (7.5”)	Longitudinal
Rear center	Rear center seat cushion	5.1 cm (2.0”)	Longitudinal
Rear center	Backlight header	6.4 cm (2.5”)	Vertical
Rear right	Rear right seat back	35.6 cm (14.0”)	Longitudinal
Rear right	Backlight header	24.1 cm (9.5”)	Longitudinal
Rear right	Right C-pillar	16.5 cm (6.5”)	Longitudinal
Rear right	Rear right seat cushion	16.5 cm (6.5”)	Longitudinal
Rear right	Backlight header	4.4 cm (1.8”)	Vertical

Exterior Damage – 1999 Ford F-350

The 1999 Ford F-350 (**Figure 11**) sustained minor frontal damage as a result of the impact with the Tempo. The vehicle was a Ford F-350 Super-Duty chassis with a steel flat-bed that measured 365.8 cm (144.0”) in length and 243.8 cm (96.0”) in width. The direct damage began at the front left corner and extended 161.3 cm (63.5”) to 67.3 cm (26.5”) right of the centerline. Paint transfers began at the left front corner and extended 98.4 cm (38.8”) to the right from direct contact with the Tempo. The front bumper was displaced slightly to the right and the plastic grille was fractured and separated. The combined direct and induced damage involved the entire frontal width of the



Figure 11. Damaged 1999 Ford F-350 truck

F-350 and measured 190.5 cm (75.0"). The left front fender sustained minor induced buckling. Six crush measurements were documented along the front bumper and were as follows: C1 = 18.4 cm (7.3"), C2 = 7.6 cm (3.0"), C3 = 7.6 cm (3.0"), C4 = 5.1 cm (2.0"), C5 = 0.0 cm, C6 = 0.0 cm. The CDC for the frontal impact with the Ford Tempo was 12-FDEW-1.

Exterior Damage – 1996 Ford Thunderbird

The 1996 Ford Thunderbird (**Figure 12**) sustained minor frontal damage as a result of the secondary impact with the Tempo. The direct damage began 17.8 cm (7.0") right of the centerline and extended 78.7 cm (31.0") to the front right corner. Paint transfers and abrasions were present on the front right aspect of the bumper fascia and on the front right aspect of the hood. The right headlamp was fractured and the bumper fascia was fractured on the right aspect. The combined direct and induced damage involved the entire frontal width of the vehicle and measured 154.9 cm (61.0"). The right front fender sustained induced buckling. Six crush measurements were documented along the front bumper and were as follows: C1 = 0.0 cm, C2 = 0.0 cm, C3 = 0.0 cm, C4 = 0.0 cm, C5 = 1.3 cm (0.5"), C6 = 10.2 cm (4.0"). The CDC for the secondary frontal impact with the Ford Tempo was 12-FZEW-1.



Figure 12. Damaged 1996 Ford Thunderbird

RESTRAINT SYSTEMS – 1992 Ford Tempo

The 1992 Ford Tempo was configured with automatic shoulder belts and manual lap belts for both front seat positions. The lap belts were configured with sewn latch plates which yielded minor abrasions consistent with minimal historical use. The rear outboard seating positions were configured with three-point lap and shoulder belts with sliding latch plates and Emergency Locking Retractors (ELR's). The rear center position was configured with a lap belt with a locking latch plate (**Figure 13**). At the time of the vehicle inspection, the center of the latch plate was located 62.2 cm (24.5") from the anchor and the excess webbing from the latch plate measured 57.2 cm (22.5"). The belt webbing was cupped as a result of the loading of the CSS against the webbing due to the intrusion of the rear seat back. The cupping on the webbing began 16.5 cm (6.5") from the anchor and extended 35.6 cm (14.0") along the webbing. A faint plastic transfer was present on the bottom aspect of the webbing (exposed to the rear of the CSS belt path) from CSS loading that measured 3.2 cm (1.3") in length, 1.9 cm (0.8") in width, and was located 33.0 cm (13.0") from the anchor.



Figure 13. Rear center lap belt

CHILD SAFETY SEAT –Forward-Facing Convertible CSS

An Evenflo Ultra-V convertible CSS was installed forward-facing in the rear center position of the Ford Tempo. The Model Number was 2341B2P1 and the date of manufacture was September

2, 1998. The CSS was configured with a 5-point harness system and a recline adjustment for use in a rear-facing mode. The CSS label stated that the CSS was designed for use by children who weigh between 2.3 and 18 kg (5 and 40 lb) and whose height is 66 to 101 cm (19 to 40"). The CSS was not configured with a tether or LATCH clips.

At the time of the vehicle inspection, the CSS was found installed in the rear-center position of the Tempo (**Figures 14 and 15**), secured by the lap belt and locking latch plate. Due to the rear seat back intrusion and rearward deflection of the driver's seat back, the CSS was projected forward and wedged between the rear seat back and the front seat backs. The distance between the CSS seat back and the front left and front right seat backs measured 20.3 cm (8.0") and 27.9 cm (11.0"), respectively. The CSS was rotated slightly CCW and leaned slightly toward the right side. The top of the CSS was located 2.5 cm (1.0") below the intruded backlight header. During the SCI inspection, the investigator was able to pull the top of the CSS forward 3.8 cm (1.5") away from the vehicle seat back.



Figure 14. View of CSS as found in the Tempo



Figure 15. Lateral view of CSS as found in the Tempo

The CSS recline adjustment was found in the upright position and the shoulder harness straps were positioned through the second set of harness slots (**Figure 16**). The harness slots in use provided no forward-facing reinforcement at that level. The harness adjustment tab extended 35.6 cm (14.0") from the forward aspect of the seat and the plastic harness retainer clip was positioned on the right shoulder harness 22.9 cm (9.0") below the right harness slot. At the time of the CSS inspection, the retainer clip was not engaged with the left shoulder harness strap. The left shoulder harness strap was folded in half starting 35.6 cm (14.0) below the right harness slot and 5.1 cm (2.0") below the right latch plate loop. Both latch plates had abrasions consistent with frequent usage. The vehicle belt locking clip was found on the harness adjustment webbing 7.6 cm (3.0") forward of the splitter plate on the bottom aspect of the CSS. There was no loading evidence present on the CSS shoulder harnesses or the harness slots due to the rear impact and subsequent rebound.



Figure 16. Evenflo Convertible CSS

Minor abrasions were present on the bottom aspects of the forward-facing belt path from engagement with the vehicle's lap belt. In the forward-facing orientation, a triangular fracture on the left outboard aspect of the plastic shell was present under the rear facing belt path (**Figure 17**). The fracture began 0.6 cm (0.3") rear of the leading edge of the rear-facing belt path and extended 3.8 cm (1.5") rearward. The plastic shell also exhibited stress marks on the left side of the shell. The first stress mark measured 4.4 cm (1.8") in length and was located 10.2 cm (4.0") forward of the rear edge and 2.5 cm (1.0") above the base of the CSS. A second stress mark that measured 2.5 cm (1.0") in length was present on the left side of the CSS and located 4.4 cm (1.8") forward of the rear aspect and 4.4 cm (1.8") above the base of the CSS. Two longitudinal stress marks were located on the bottom aspect of the plastic CSS base. The first measured 3.8 cm (1.5") in width and was located 21.6 cm (8.5") rear of the forward aspect of the base and 9.5 cm (3.8") left of the centerline. The second measured 5.7 cm (2.3") in width and was located 24.1 cm (9.5") rear of the forward aspect and 14.0 cm (5.5") left of the centerline. Minor abrasions were present on the front and rear outboard corners of the plastic shell.



Figure 17. Left side view showing fracture and stress marks

OCCUPANT DEMOGRAPHICS – 1992 Ford Tempo

Driver

Age/Sex:	20-year-old/Female
Height:	163 cm (64")
Weight:	75 kg (165 lb)
Seat Track Position:	Mid-track
Manual Restraint Use:	Automatic 2-point shoulder belt
Usage Source:	Vehicle inspection, lack of historical use evidence on lap belt
Eyewear:	Unknown
Type of Medical Treatment:	Transported by ambulance to a local hospital for evaluation and released

Driver Kinematics

The 20-year-old female driver was presumed to have been seated in an upright posture. The seat track was adjusted to a mid-track position and she was restrained by the automatic 2-point shoulder belt. Based on the lack of historical use evidence, it was unlikely that she was utilizing the manual lap belt at the time of the crash.

At impact, the driver initiated a rearward trajectory and loaded the driver's seat back, deforming the seat back rearward. The deformation of the driver's seat back probably provided a ride-down of the severe crash forces. She rebounded forward and was displaced to the right as the vehicle rotated CCW across the intersection. The automatic shoulder belt exhibited minor stretching from the driver's rebound. She loaded the center console/armrest, which resulted in the lateral

displacement of the center armrest. The driver was redirected rearward and to the left as it was struck in the rear left corner by the Ford Thunderbird. She loaded the seat back a second time, although the loading that resulted from the secondary impact was not as severe as the initial impact. The driver exited the vehicle under her own power. The driver did not sustain injury. She was transported by ambulance to a local hospital for evaluation and released.

Second Seat Center Child Passenger (Forward-Facing CSS)

Age/Sex: 10-month-old/Female
 Height: Unknown
 Weight: 9 kg (20 lb)
 Seat Track Position: Fixed
 Manual Restraint Use: Forward-facing convertible CSS with a 5-point harness
 Usage Source: Vehicle inspection, CSS inspection
 Eyewear: None
 Type of Medical Treatment: Transported by ambulance to a local hospital for treatment and released

Second Seat Center Child Passenger (Forward-Facing CSS) Injuries

Injury	Injury Severity (AIS 90/Update 98)	Injury Mechanism
Left forehead contusion	Minor (290402.1,7)	Loose baby bottle/toy

Injury source: Emergency room records

Second Seat Center Child Passenger (Forward-Facing CSS) Kinematics

The 10-month-old child was restrained in the forward-facing convertible CSS that was installed on the rear center position of the Ford Tempo. At impact, the female child initiated a rearward trajectory and loaded the rear aspect of the CSS. The CSS loaded the rear seat back as the seat back intruded into the passenger compartment, evidenced by scuffs on the rear seat back fabric from the CSS. During the impact, a loose object struck the child on the forehead, which resulted in a left forehead contusion. The driver stated that the child was struck with a baby bottle, although a plastic baby toy was found in the vehicle during the inspection. The toy was constructed of five plastic links that were connected between two larger plastic toys. The toy measured 45.7 cm (18.0”) in length and 14.0 cm (5.5”) in height. The child rebounded forward as the CSS was compressed against the front seat backs and loaded the harness system, which was not configured in the forward-facing (reinforced) slots. The CSS loaded the lap belt as it rebounded forward toward the front of the vehicle. It was possible that the child may have impacted the front seat backs during the rebound. The child was subsequently redirected to the right in the CSS as the vehicle rotated CCW across the intersection, evidenced by the slight CCW displacement of the CSS within the lap belt. The child was redirected rearward a second time in response to the secondary rear impact, although her loading against the CSS was not as severe as the initial impact. The driver removed the child from the CSS. She held the child in her arms outside the vehicle until rescue personnel arrived. The 10-month-old was placed in an inflatable CSS by the ambulance crew and transported by ambulance to a local hospital. The child was treated and released.

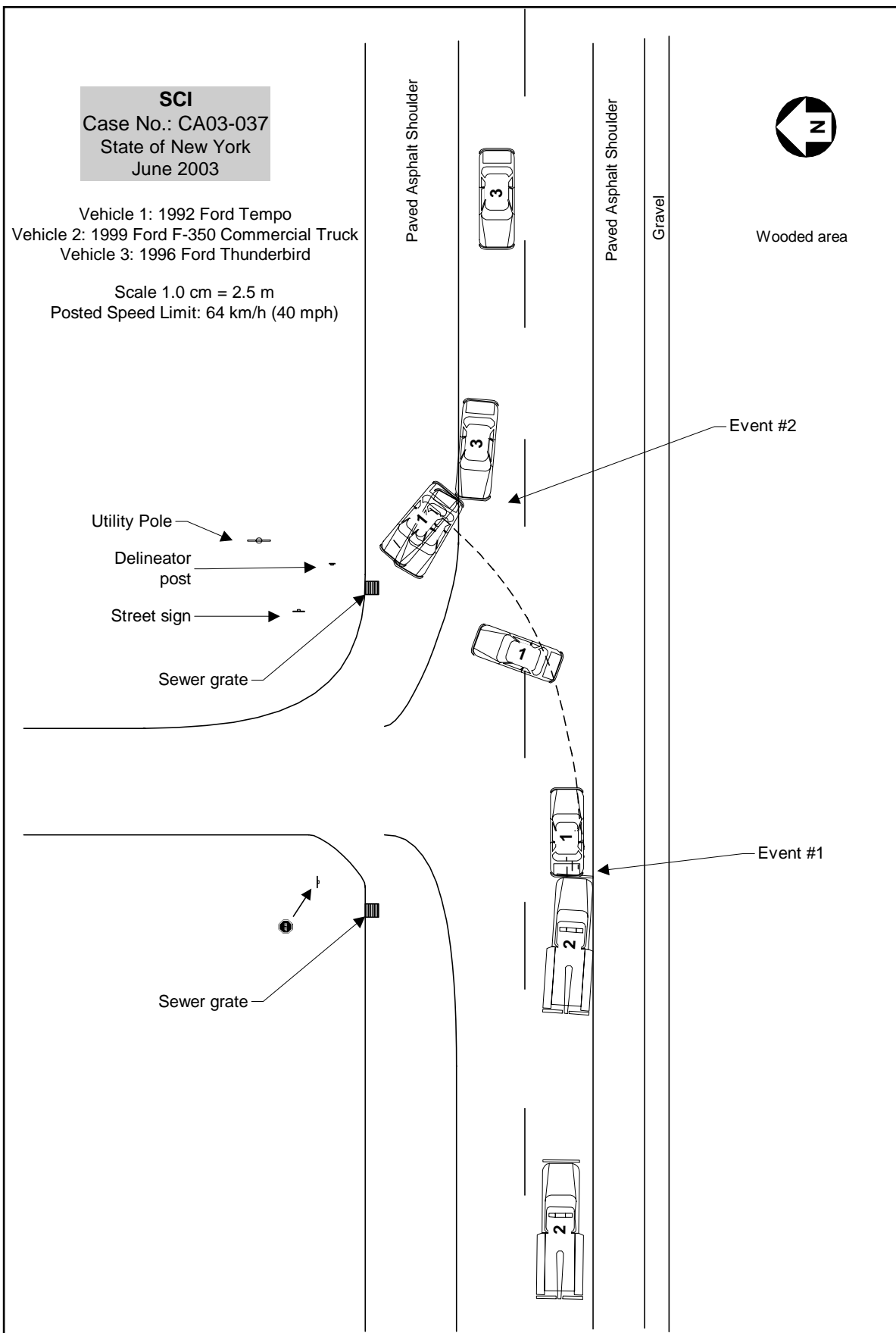


Figure 18. Scene schematic